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INTRODUCTION

In this issue of the University Record an account is given of the productive work of the scientific departments of the University outside of the routine work of teaching. A similar review will be given later of the other departments.

It is important that this work of investigation and research, in fact of productive scholarship, should be emphasized. It marks in great measure the difference between a mere college and a university. It tells the story of earnest efforts to extend the horizon of human knowledge and should mean a freshness and inspiration in teaching which cannot well be secured otherwise. The worthy showing made in this regard by the University should be a matter of interest to the alumni and friends.

While the period covered by this Record is from 1795 to 1910 it must be borne in mind that the first seventy years, or until 1865, was a time of great dearth in such research and publication all over the country. Few men were trained for it and student laboratories were unknown. Then followed for this institution a period of grave depression with eventual closing of the doors. The University was reopened in 1875, almost without equipment and having only a scanty income. It is noteworthy that any sort of research was undertaken by the members of the faculty under such conditions of inadequate laboratories and overwork.

These conditions have improved and with them the amount and character of the work. It is hoped that the future will see still greater activity.

SCIENTIFIC INVESTIGATION BY THE FACULTY OF THE UNIVERSITY OF NORTH CAROLINA PREVIOUS TO THE RESTORATION OF THE UNIVERSITY IN 1875

FIRST PERIOD, 1795 to 1868

The University of North Carolina opened its doors for students in 1795 with practically nothing in the way of scientific equipment. Its first president was Joseph Caldwell, a mathematician and graduate of Princeton College. President Caldwell greatly preferred his work in mathematics and was reluctant to take up the duties of president, and indeed after serving some years withdrew from the office, but was forced by the needs of the institution to take them up again. The only evidence of Dr. Caldwell's activity as a mathematician consists of a volume entitled "A Compendium System of Elementary Geometry, together with a Treatise on Plane Trigonometry," published in 1822, chiefly as a text-book for his students.

In 1824 President Caldwell was empowered by the Trustees to make certain purchases of books and scientific apparatus while on a visit to Europe. The cost of this apparatus, styled in the accounts "philosophical and astronomical apparatus," was nearly $4,000.

GEOLOGICAL SURVEY

In 1817 Denison Olmsted was elected professor of chemistry and Elisha Mitchell, professor of mathematics and natural philosophy. These two had been classmates at Yale. Olmsted was granted a year's leave for further study at Yale and took up his duties in the University in 1818. He afterwards (1825) became professor of mathematics and natural philosophy in Yale College and made many contributions to physical science,

In 1822 the State Legislature established a Board of Agriculture, and in 1823 this Board was authorized to employ a "person of competent skill and science to commence and carry on a geological and mineralogical survey of this State". The remuneration granted was $250 a year. Professor Olmsted was employed by the Board. He issued one report which was probably the first published report of any State Geological Survey in the Union. Professor Mitchell carried on the survey after the withdrawal of Olmsted and also issued one report. The appropriation originally made for four years and one additional year was not renewed.

THE OBSERVATORY

In 1827 President Caldwell erected a building in which he could make use of the telescope and other astronomical instruments bought by him in London. So far as known, this was the first observatory to be erected in connection with any institution of learning in America. Dr. Battle gives the following account of it in his *History of the University of North Carolina* (Vol. I., p. 335.)

"The building was on the highest summit of a hill north of the Raleigh road, near the village graveyard. The structure was about twenty feet square, without a portico or entry hall, and with a window in each of its eastern and western faces. Through the centre was a pillar of masonry on its own foundation and on a circular disk on the top was the altitude and azimuth instrument. A slit through the northern and southern faces and through the flat top afforded a range of 180 degrees for the transit. It was protected from the weather by a wooden structure drawn backwards and forwards on a railway by a windlass and a rope. The adjacent trees were felled so as to command a view of the horizon. The instruments used were a meridian transit and telescope, made by Simms of London, an altitude and azimuth telescope, also by Simms, a telescope for observation on the earth and sky, made by Dolland, of London, an astronomical clock with a mercurial pendulum

(still running in 1910 and keeping excellent time), made by Molineux. Besides these, which were stationary, there were a sextant by Wilkinson of London, a portable reflecting circle, by Harris of London, and a Hadley's quadrant. With the astronomical clock and the transit, President Caldwell, assisted by Professors Mitchell and Phillips, obtained the longitude and latitude of the South Building, 79 degrees, 17 minutes west and 35 degrees 54 minutes 21 seconds north." The records of observations he made on eclipses, comets and other celestial phenomena have been lost. In 1838 the building was destroyed by fire.

SCIENTIFIC WORK OF ELISHA MITCHELL

Dr. Mitchell was a graduate of Yale College in the class of 1813. Young Denison Olmsted was a member of the same class, and the two entered the faculty of the University of North Carolina in 1818; Mitchell as professor of mathematics and natural philosophy. On the withdrawal of Olmsted in 1825, Mitchell became professor of chemistry, Dr. James Phillips taking charge of the instruction in mathematics and natural philosophy. Mitchell's first published work was the second volume of the State's Geological Survey. He had aided Olmsted in the survey work connected with the first report and visited and studied many sections of the State. All branches of natural science possessed an absorbing interest for him. His note books contain many botanical notes with lists of flowers, mosses, trees, etc. His observations were carefully made and contain criticisms of the description in Pursh, Elliot, Michaux, Nuttall, etc., together with memorabilia about points still doubtful. In mineralogy and geology he was an equally ardent student. Dr. Mitchell published "Notes on Natural History" and a "Manual of Chemistry", a manual of Geology with a geological map of North Carolina and a "Geography of the Holy Land" for the use of his students. His very valuable chemical library, still in the possession of the University, was fairly complete in its editions of the masters of science in the latter part of the eighteenth and first half of the nineteenth century.

In geography, Dr. Mitchell was especially interested in the altitudes of the mountain peaks in Western North Carolina. Michaux, who had climbed the Grandfather Mountain in 1794, had stated that this peak was "La plus haute montagne de toute l'Amerique Septentrionale." Dr. Mitchell did not believe this to be true. Selecting the highest peak of Black Mountain in 1835, he made careful measurement of it and published that it was 5,508 feet above Morganton or 6,476 feet above the level of the sea. Morganton was at the time supposed to be 968 feet above sea level. The true elevation of Morganton, however, is 1,200 feet, and this would make the peak—now known as Mitchell's peak—6,708 feet. In 1844 it was measured again by Mitchell with the result of 6672 feet; by Clingman in 1855, 6941; by Guyot in 1856, 6701; by James Wilson in 1857, 6711; and by the United States Coast Survey, 6,688.

Other mountains were measured by him, as Table Rock, Grandfather, Yeates' Knob, Young's Knob and the Roan. These measurements were made under great difficulties and at the cost of severe labor, as much of the region was practically unexplored and a trackless wilderness. In the effort at verifying certain of his observations he lost his life near the summit of Mount Mitchell in 1857 and lies buried on this, the highest bit of land east of the Mississippi river.

Dr. Mitchell published much concerning the resources of North Carolina in the newspapers of the day. His strictly scientific articles are limited to a few contributions to the American Journal of Science. The titles of these follow:

1830. A Substitute for Welther's Safety Tube.

1830. The Geology of the Gold Regions of North Carolina.

1831. On the Causes of Winds and Storms.

1831. An Analysis of the Protogaea of Leibnitz.

1831. A reply to Redfield's Criticism of his Article on Winds and Storms.

1839. Observations on the Black Mountains of North Carolina.

There seems little question that with wider opportunities Dr,

Mitchell would have gained an eminent position as a man of science in this country. It is in his honor that the Elisha Mitchell Scientific Society of the University of North Carolina was named.

NICHOLAS MARCELLUS HENTZ

Professor N. M. Hentz was professor of modern languages in the University of North Carolina from 1826 to 1831. He was born in Versailles, France, studied medicine and came to America with his father, who had been proscribed after the fall of Napoleon. He taught in Philadelphia, Boston and other places, coming to Chapel Hill in 1824. After leaving the University he continued teaching, having charge of various academies until his health failed. He died at Mariana, Florida, in 1856. He was one of the pioneers in American entomology and became the highest authority on American spiders. All of his leisure hours, during his life as a teacher, were devoted to these studies.

He was very fortunate in selecting the spiders as his special field of study, for little or nothing at that time had been published on North American spiders. His time was given to the observation of their habits, and to the selection, description and representation of the various species. He published a few papers in Silliman's Journal and in the Journal of the Philadelphia Academy of Arts and Sciences, and then brought together his extensive series of notes and paintings, and offered them to the Boston Society of Natural History for publication in its Journal. The publication of these extended over a number of years. Some years ago, as many of the publications were out of print, the Council of the Society determined to republish, in a connected form, all of Hentz' arachnological writings. When this was done a considerable number of notes and descriptions were added by Mr. J. H. Emerton, and a few notes were also added by Mr. Wm. Holden. (The Spiders of the United States, by Nicholas Marcellus Hentz, M. D. Occasional papers of the Boston Society of Natural History.)

List of the Writings of Professor Hentz

1821. 1. A Notice Concerning the Spider whose Web is Used in Medicine (Tegenaria medicinatis).
Jour. Phil. Acad. Nat. Sci. II. 53.

1825. 2. Some Observations on the Anatomy and Physiology of the Alligator of North Carolina.
Trans. Am. Phil. Soc. II. 216.

1825. 3. Description of some new Species of North American Insects.
Jour. Phil. Acad. Nat. Sci. V. 373.

1830. 4. Description of Eleven New Species of North American Insects.
Trans. Amer. Soc. III. 253.

1830. 5. Remarks on the Use of the Maxillae in Coleopterous Insects, with an Account of Two Species of Telophoridae and Three Species of Mordellidae which ought to be the Type of Two Distinct Genera.
Ibid. 458.

1832. 6. On North American Spiders. Silliman's Journal of Science and Arts. XXI. 99.

1833. 7. Enumeration of the Spiders of the United States. Hitchbock's Report on Geology, etc., of Massachusetts, p. 564.

1841. 8. Description of an American Spider (Spermophora Meridionalis), constituting a new Subgenus of the Tribe Inaequitalae, Latreille. Silliman's Journal, XLI. 115.

1841. 9. Species of Mygale of the United States. Bost. Soc. Nat. Hist. I. 41-42.

1842. 10. Description and Figures of the Arachnides of the United States. Bost. Soc. Nat. Hist. IV. 55.

1842. 11. Continuation, ibid. IV. 223.

1844. 12. Continuation, ibid. IV. 386.

1845. 13. Continuation, ibid. V. 189.

1846. 14. Continuation, ibid. VI. 352.
1847. 15. Continuation, ibid. V. 444.
1850. 16. Continuation, ibid. VI. 18.
1850. 17. Conclusion, ibid. VI. 271.

OTHER SCIENTIFIC CONTRIBUTIONS

It only remains to record a few scattered contributions as completing the original scientific work done in the University of North Carolina previous to the interruption brought on by the civil war.

First, there are the Meteorological Observations taken by James Phillips, Professor of Mathematics and Natural Philosophy. These are in manuscript record. They were minutia and full, extending from 1844 to the close of 1862, or in all, nineteen years.

The following botanical observations were made and published later.

JAMES PHILLIPS, K. P. BATTLE AND R. H. BATTLE

1. Dates of flowering plants near Chapel Hill. Mitch. Sci. Soc. J. I. 45.

2. Dates of Foliation of plants near Chapel Hill. Mitch. Sci. Soc. J. II. 47.

In mathematics the following publications were made:

1. By Joseph Caldwell. A compendium system of Elementary Geometry and subjoined a Treatise on Plane Trigonometry. Printed at Philadelphia, 1822.

2. By Charles Phillips. A Manual of Plane and Spherical Trigonometry with some of its Applications. Printed at Raleigh, 1857.

SCIENTIFIC INVESTIGATION AT THE UNIVERSITY OF NORTH CAROLINA

SECOND PERIOD, 1875 to 1910

BOTANY

J. A. Holmes (See under Geology.)

1. 1883. Occurrence of Abies Canadensis and Pinus Strobus in Central North Carolina. Mitch. Sci. Soc. J. I. 86.
2. 1884. Taxodium (Cypress) in North Carolina. Mitch. Sci. Soc. J. I. 92.

George F. Atkinson, Associate Professor of Natural History, University of North Carolina, 1885-1888. Professor of Botany, Cornell University.

1. 1890. Some Erysipheae from North Carolina and Alabama. Mitch. Sci. Soc. J. VII. 61.
2. Some Cercosporae from Alabama. Mitch. Sci. Soc. J. VIII. 33.

William C. Coker, B. S. University of South Carolina, 1894; Ph. D. Johns Hopkins University, 1901. Associate Professor of Botany in the University of North Carolina, 1902-1908. Professor of Botany, 1908. Member American Association for the Advancement of Science; Botanical Society of America; North Carolina Academy of Science.

1. 1902. Notes on the Gametophytes and Embryo of Taxodium. Bot. Gaz. XXXIII. 89.
2. 1903. The Woody Plants of Chapel Hill. Mitch. Sci. Soc. J. XIX. 42.
3. On the Gametophytes and Embryo of Podocarpus. Bot. Gaz. XXXVI. 1 and 114.
4. Algae and Fungi for Class Work. J. Ap. Micros. VI. 2411.
5. A New Method of Sprouting Pollen. J. Ap. Micros.

VI. 2495.

6. Selected Notes, No. 1. Bot. Gaz. XXXVI. 136.

7. Selected Notes, No. 2. Bot. Gaz. XXXVI. 225.

8. 1904. Chapel Hill Liverworts. Mitch. Sci. Soc. J. XX. 35.

9. On the Spheres of Certain Coniferae. Bot. Gaz. XXXVIII. 206.

10. Selected Notes, No. 3. Bot. Gaz. XXXVI. 60.

11. 1905. Vegetation of the Bahama Islands. From the "Bahama Islands," pp. 185-270.

12. Observations on the Flora of the Isle of Palms, Charleston, S. C. Torreya. V. 135.

13. 1907. Chapel Hill Ferns and their Allies. Mitch. Sci Soc. J. XXIII. 134.

14. Fertilization and Embryology in Cephalotaxus Fortueni. Bot. Gaz. XLIII. 11.

15. The Development of the Seed in Pontederiacceae. Bot. Gaz. XLIV. 293.

16. 1908. A New Species of Achlya. Bot. Gaz. XLV. 94.

17. 1909. A Visit to the Yosemite and the Big Trees. Mitch. Sci. Soc. J. XXV. 131.

18. Vitality of Pine Seeds and the delayed Opening of the Cones. Am. Nat. XLIII. 677.

19. Additions to the Flora of the Carolinas. Bull. Torr. Bot. Club. XXXVI. 635.

20. Liverwort Types for Elementary Classes. Torreya. IX. 233.

21. Lycopodium adpressum forma polyclavatum from South Carolina. Fern Bulletin. XVII. 83.

22. Some Rare Abnormalities in Liverworts. Bryologist. XII. 104.

23. A doubly Flowered Sarracenia. The Plant World. XII. 253.

24. Septolegnia from North Carolina. Mycologia. I. 262.

In the summer of 1903 the Geographical Society of Baltimore organized an expedition, consisting of a number of scientists, for

the study of the Bahama Islands. Dr. W. C. Coker was placed in charge of the botanical explorations and two of his students of the preceding year, Mr. C. A. Shore and Mr. F. M. Hanes, were appointed as his assistants. A large number of the islands were visited and the results were published by the Macmillan Co. in 1905 in a single volume, entitled "The Bahama Islands". Of this volume Dr. Coker contributed the chapter on Botany, as given in the preceding list.

CHEMISTRY

Francis Preston Venable, Ph. D., Sc. D., LL. D. Educated at the University of Virginia 1873-79; Bonn 1879-80; Gottingen 1881; Berlin 1889; Professor Chemistry, University of North Carolina, 1880-1900; President 1900—; Member American Chemical Society. Councillor. President 1905. Fellow London Chemical Society. Member German Chemical Society. Member American Philosophical Society.

1. 1883. A Course in Qualitative Chemical Analysis. Univ. Pub. Co., N. Y., (4 editions).
2. 1894. A Short History of Chemistry. D. C. Heath & Co., Boston. (3 editions).
3. 1896. The Development of the Periodic Law. Chem. Pub. Co., Easton.
4. 1898. Inorganic Chemistry according to the Periodic Law (in conjunction with J. L. Howe of Washington & Lee University). Chem. Pub. Co., Easton.
5. 1904. The Study of the Atom. Chem. Pub. Co., Easton, Pa.
6. 1882. Heptylena from Heptane of P. Sabiniana. J. Am. Chem. Soc. III and IV. 22.
7. Action of Alcoholic Potash on Heptylene Bromide. J. Am. Chem. Soc. III and IV. 254.
8. Analysis of Rock Salt from Saltville, Va. (with Thomas Radcliffe). J. Am. Chem. Soc. III and IV. 255.
9. Analysis of Blast Furnace Deposit (with Thomas

Radcliffe). J. Am. Chem. Soc. III and IV. 256.

10. 1883. Heptylmalonic and Heptylacetic Acids. J. Am. Chem. Soc. V. and VI. 10.

11. 1884. Hydrated Carbon Bisulphide. J. Chem. Soc. 260.

12. Zinc in Drinking Water. Am. Chem. Soc. VI. 214.

13. Decomposition of Potassium Cyanide (with J. F. Wilkes). Mitch. Sci. Soc. J. I. 18.

14. Action of Ammonium Hydroxide upon Lead Chlorides (with Julian Wood). Mitch. Sci. Soc. J. I. 24.

15. Alterability of Amorphus Phosphorus (with J. C. Roberts). Mitch. Sci. Soc. J. I. 43.

16. Action of Ammonium Hydroxide upon Lead Iodide (with J. C. Roberts). Mitch. Sci. Soc. J. I. 43.

17. Solubility of N. C. Phosphate Rock (with J. L. Borden). Mitch. Sci. Soc. J. I. 53.

18. 1885. Analysis of Leaves of Ilex Cassine. Am. Chem. Soc. VII and VIII. 100.

19. Occurrence of Citric and Malic Acids in Peanuts. (with E. A. deSchweinitz). Mitch. Sci. Soc. J. II. 47.

20. Some Attempts at Forming Heptyl Benzol from Secondary Heptane. Mitch. Sci. Soc. J. II. 77.

21. Ammonia in Saliva (with Max Jackson). Mitch. Sci. Soc. J. II. 85.

22. Solubility of Barium Chromate (with J. F. Wilkes). Mitch. Sci. Soc. J. II. 90.

23. 1886. A Thermometer for Class Illustration. Mitch. Sci. Soc. J. III. 142.

24. 1887. A New Test for Iron. J. Anal. Chem. I. No. 3. 312.

25. A New Form of Bunsen Burner. J. Anal. Chem. I. No. 3. 310.

26. Some New Salts of Camphoric Acid (with I. H. Manning). Mitch. Sci. Soc. J. IV. 52.

27. Decomposition of Potassium Cyanide (with I. H.

Manning). Mitch. Sci. Soc. J. IV. 54.

28. Lead Chlor-sulphocyanide (with R. G. Grissom). Mitch. Sci. Soc. IV. 55.

29. Action of Chlorous Acid upon Heptylene (with R. G. Grissom). Amer. Chem. Journal. 1887. X. 225.

30. Simple Apparatus for Electrolysis of Water. J. Anal. Chem. II. No. 1, 2.

31. 1888. Analysis of North Carolina Wines (with W. B Phillips). J. Anal. Chem. II. No. 1, 7.

32. A Partial Chemical Examination of Some Species of Genus Ilex. Mitch. Sci. Soc. J. V. 128.

33. New Salts of Camphoric Acid (with G. W. Edwards). Mitch. Sci. Soc. J. V. 8.

34. New Halogen Compounds of Lead (with B. Thorp) Am. Chem. J. X. 229.

35. The Bromination of Heptane. Am. Chem. J. 1888. X. 237.

36. 1889. Recalculations of the Atomic Weights. J. Anal. Chem. III. No. I. 48.

37. 1890. Two New Meteoric Irons. Amer. J. Sci. XL. 161.

38. Occurrence of Boracic Acid as an Impurity in Caustic Alkalies (with J. S. Callison). J. Anal. Chem. IV. No. 2. 197.

39. Distribution of Boracic Acid in Plants (with J. S. Callison). Jour. Anal. Chem. IV. No. 2.

40. The Proper Standard for the Atomic Weights. Mitch. Sci. Soc. VII. 75.

41. Action of Phosphorus upon Certain Metallic Salts (with Gaston Battle). Mitch. Sci. Soc. J. VII. 80.

42. Lead Chloro-bromides. Amer. Chem. J. 1890. III. 52.

43. Lead Bromo-nitrates (with H. L. Miller). Mitch. Sci. Soc. J. VII. 84.

44. 1891. Treatment of Zircons in preferring Zirconium Chloride. J. Anal. Chem. V. 551.

45. Complete Quantitative Analysis of Zircon (with

J. M. Morehead). Mitch. Sci. Soc. J. VIII. 24.

46. 1893. Attempts at Forming Ethyl Glucoside (with J. R. Harris). Mitch. Sci. Soc. J. X. 87.

47. 1894. The Chlorides of Zirconium. Am. Chem. Soc. XVII. 842.

48. Recent work upon the Periodic Law. A. A. A. S. Springfield Meeting.

49. The Atomic Weights and their Natural Arrangement. Mitch. Sci. Soc. J. XI. 67.

50. 1895. An Early American Arrangement of the Elements. Am. Chem. Soc. XVII. 947.

51. A Modified Arrangement of the Elements under the Periodic Law. Am. Chem. Soc. J. XVII. 75.

52. Zirconium Sulphites (with Charles Baskerville.) Am. Chem. Soc. XVII. 448.

53. A Study of the Zirconates (with Thos. Clarke). Am. Chem. Soc. XVIII. 434.

54. Some Properties of Calcium Carbide (with Clarke). Am. Chem. Soc. XVII. 306.

55. 1896. The Periodic Law in Teaching Chemistry. A. A. A. S. Boston Meeting.

56. The Present Position of the Periodic System. Mitch. Sci. Soc. XIII. 2.

57. 1897. The Oxalate of Zirconium (with Baskerville). Am. Chem. Soc. XIX. 12.

58. 1898. A Revision of the Atomic Weight of Zirconium. Am. Chem. Soc. XIX. 119.

59. A Modified Air Bath. Am. Chem. Soc. XX. 271.

60. Some Properties of Zirconium Dioxide (with A. W. Belden). Am. Chem. Soc. XX. 273.

61. Note on Liquid Phosphorus (with Belden). Am. Chem. Soc. XX. 303.

62. The Oxyhalides of Zirconium (with Baskerville). Am. Chem. Soc. XX. 321.

63. Change of Color in Solutions of Chromium Salts (with F. W. Miller). Am. Chem. Soc. XX. 484.

64. Natural Science of the Ancients as interpreted by Lucretius. Mitch. Sci. Soc. J. XV. 62.
65. 1899. The Nature of Valence. Am. Chem. Soc. XXI. Feb. and March. 192, 220.
66. Definition of the Element. A. A. A. S. Columbus Meeting.
67. Some Organic Salts of Zirconium. Am. Chem. Soc. Proc.
68. Iron and Ammonium Chloride (with Miller). Am. Chem. Soc. Proc. 101.
69. Secondary Heptylamine (with Clarke). Am. Chem. Soc. J. XXI. 1027.
70. Absence of Solanin in Tomato (with E. V. Howell). Am. Chem. Soc. Proc.
71. A Study of Certain Double Chromates (with W. G. Haywood). Mitch. Sci. Soc. J. XVI. 56.
72. 1900. Richter and the Periodic Law. Mitch. Sci. Soc. J. XVII. 19.
73. Nature of Change in Solutions of Chromium Salts. Am. Chem. Soc. XXII. 111.
74. Composition of Commercial Chromium Sulphate. Proc. Am. Chem. Soc. 40.

William Battle Phillips. Ph. B. University of North Carolina, 1877; Ph. D., 1883. Studied at Freiberg. Chemist State Experiment Station 1877-82. Chemist Navassa Fertilizer Co., 1882-1885. Professor Agricultural Chemistry and Mining, University of North Carolina, 1885-87. Professor of Chemistry, University of Alabama, 1890-92. Professor of Field and Economic Geology, University of Texas, 1900——

1. 1884. Rate of Reversion in Superphosphates prepared from Red Navassa Rock. (Thesis for Ph. D.). Mitch. Sci. Soc. J. 1. 56.
2. 1888. Analysis of North Carolina Wines. (See F. P. Venable.)
3. Changes in Bottled Samples of Acid Phosphates.

Mitch. Sci. Soc. V. 22.

4. 1889. Mica Mining in North Carolina. Mitch. Sci. Soc. J. V. 73.
5. Of the three Crystallographic Axes. Mitch. Sci. Soc. J. V.
6. Chlorination of Auriferous Sulphides (with E. A. Thies). Mitch. Sci. Soc. J. V. 69.

CHARLES BASKERVILLE. B. S. University of North Carolina, 1892; Ph. D., 1894. Assistant in Chemistry, 1891. Professor of Chemistry 1900-1904. Professor of Chemistry, College of the City of New York, 1904— Member American Chemical Society; English Chemical Society; German Chemical Society.

1. 1893. Determination of Phosphorus in Titaniferous Iron Ores. J. Anal. Chem. XII. No. 4. 1062.
2. 1894. A New Method for Separation of Zirconium. J. Anal. Chem. VII. No. 7.
3. Preparation of Pure Compounds of Zirconium. Mitch. Sci. Soc. J. XI. 85.
4. Separation of Titanium from Iron. Am. Chem. Soc. XVI. No. 6.
5. Separation of Zirconium by means of Sulphuric Acid. Am. Chem. Soc. XVI. 475.
6. Zirconium Sulphites. (See Venable.)
7. Reduction of Concentrated Sulphuric Acid by Copper. Am. Chem. Soc. XVIII. 942.
8. Reactions between Copper and Concentrated Sulphuric Acid. Am. Chem. Soc. XVII. 904.
9. 1896. Reduction of Concentrated Sulphuric Acid by Copper. Am. Chem. Soc. XVIII. No. 11.
10. 1897. The Oxalates of Zirconium. (See Venable.)
11. Reaction between Mercury and Concentrated Sulphuric Acid (with F. W. Miller). Am. Chem. Soc. XIX. 873.
12. 1898. Decomposition of Concentrated Sulphuric Acid by Mercury at ordinary temperatures (with Miller). Am. Chem. Soc. XX. 55.

13. 1899. Condensation of Chloral with o-m-p Nitranilines. Proc. Am. Chem. Soc. 101.
14. A Case of Spontaneous Combustion. Mitch. Sci. Soc. J. XVI. 81.
15. Index to Literature of Zirconium (with A. C. Langmuir). Smith. Misc. Collections. 1173.
16. Occurrence of Vanadium. Chromium and Tungsten in Peats. Am. Chem. Soc. XXI. 706.
17. Universal Distribution of Titanium. Am. Chem. Soc. XXI. 1099.
18. 1900. The Adic and Wood Method for determination of Potash (with I. F. Harris). Mitch. Sci. Soc. J. XVI. 18.
19. Analysis of Titaniferous Iron Ores. Soc. Chem. Ind. XIX. No. 5. 419.
20. Note on Qualitative Test for Tin. Mitch. Sci. Soc. J. XVI. No. 2.
21. Qualitative Determination of Tin, Arsenic and Antimony. Proc. Am. Chem. Soc. 40.
22. 1901. Complaints against Fertilizer Factories. Am. Fertilizer. XIV. 12.
23. A Basis of Scientific Thought. Science N. S. XIV. 165.
24. Some Hydrochlorated Sulphates (with Harris and Weil). Am. Chem. Soc. XXI. 894.
25. On the Existence of a New Element associated with Thorium. Am. Chem. Soc. XXIII. 761.
26. 1902. A Novel Constant High Temperature Bath. Am. Chem. Soc. XXIV. 1025.
27. Black Rain in North Carolina (with H. R. Weller). Science N. S. XV. 1034.
28. Process for Rendering Phosphoric Acid Available. Soc. Chem. Ind. XXI. 1519.
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GEOLOGY

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MATHEMATICS

RALPH H. GRAVES. C. E., University of Virginia. Professor of Mathematics, University of North Carolina, 1879-1889.

1. 1887. On the Chord common to a Parabola and the Circle of Curvature at any Point. Annals of Mathematics III. 50.

2. On the Focal Chord of a Parabola. Annals of Mathematics. IV. 153.

3. 1888. A Method of Finding the Evolute of the Four Cusped Hypocycloid. Annals of Mathematics. IV. 1888.

WILLIAM CAIN. M. A., North Carolina Military and Polytechnic Institute, 1865. Professor Methematics and Engineering, Carolina Military Institute, 1874-1880, Professor Mathematics South Carolina Military Academy, 1882-1889; Professor of Mathematics in the University of North Carolina, 1889— Member American Association for the Advancement of Science; Mathematical Society, and the Society of Civil Engineers.

1. 1893. Theory of Vaussoir Arches. Second Edition.

2. 1897. Maximum Stresses in Framed Bridges. Second Edition.

3. 1905. A Brief Course in the Calculus.

4. 1909. Theory of Steel Concrete Arches and of Vaulted Structures. Fifth Edition.

5. Theory of Solid and Braced Elastic Arches. Second Edition.
6. 1910. Practical Engineering of Retaining Walls. Sixth Edition.
7. 1889. Portal Bracing. Engineering News. July.
8. 1891. Determination of the Stresses in Elastic Systems by the Method of Least Work. Trans. Amer. Soc. Civil Engineers.
9. Brief Demonstration of the Method of Least Work. Mitch. Sci. Soc. J. VIII.
10. 1892. The Transition Curve. Trans. Am. Soc. C. E.
11. On the Fundamental Principles of the Differential Calculus. Mitch. Sci. Soc. J. IX.
12. 1893. The Stone Arch. Mitch. Sci. Soc. J. X.
13. 1896. Exact Computation of the Stresses in a Queen-Post Truss. Mitch. Sci. Soc. J. XIII.
14. 1898. Pressure on Coal Bins. Eng. News.
15. Theory of Ideal Columns. Trans. Am. Soc. C. E.
16. 1901. A Method for laying out Grades for Sewers by Aid of the Transit. Mitch. Sci. Soc. J. XVII.
17. 1903. Note on the Algebraic Form per cent. Mitch. Sci. Soc. J. XIX.
18. Imaginary Roots of a Cubic. Mitch. Sci. Soc. J. XIX.
19. 1904. Note on Grain Pressures in Deep Bins. Eng. News.
20. Crown Thickness of Masonry Arches. Eng. News.
21. 1905. Theory of the Spherical or Conical Dome of reenforced Concrete or Metal. Proc. Am. Soc. C. E.
22. 1909. Stresses in Masonry Dams. Proc. Am. Soc. C. E.

Archibald Henderson. B. A., University of North Carolina, 1898; M. A., 1901; Ph.D., 1902. Student at the University of Chicago. Instructor in Mathematics, University of North Carolina, 1899-1902. Fellow in Mathematics, University of Chicago, 1902-1903. Associate Professor of Mathematics, University of North Carolina, 1903-1905. Professor of Mathematics, 1908—

1. 1901. The Cone of the Normals and an allied Cone for Central Surfaces of the Second Degree. Mitch. Sci. Soc. J. XVIII.
2. 1902. Two Simple Constructions for finding the Foci of an Hyperbola, given the Asymptote and a Point on, or a Tangent to, the Curve. Am. Math. Monthly. Nov.
3. A Method for Constructing an Hyperbola, given the Asymptote and a Focus. Am. Math. Monthly. Dec.
4. 1903. The Derivation of the Briandeon Configuration from two Spatial Point Traids. Am. Math. Monthly. Feb.
5. Harmonic Pairs in the Complex Plane. Am. Math. Monthly. Mar.
6. A purely Geometric Treatment for certain Masses defined by the Substitution w-1-2(2-12). Am. Math. Monthly. April.
7. 1904. The Graphic Representative of the Projection of two Triads of Planes into the Mystic Hexegram. Mitch. Sci. Soc. J. XX.
8. 1905. A Memoir on the Twenty-Seven Lines Upon a Cubic Surface. Mitch. Sci. Soc. J. XXI.
9. 1907. The Foundations of Geometry. An Historical Sketch. Mitch. Sci. Soc. J. XXIII.

MEDICAL SCIENCE

RICHARD HENRY WHITEHEAD. A. B., Wake Forest College, 1886. M. D., University of Virginia, 1887. LL. D., University of North Carolina, 1909. Demonstrator of Anatomy, University of Virginia, 1887-89. Professor of Anatomy and Dean of the Medical Faculty, University of North Carolina, 1890-1905. Professor of Anatomy and Dean of the Medical Department, University of Virginia, 1905—

1. 1900. Anatomy of the Brain. Text-Book. Philadelphia. 1900.

2. Contribution to the Study of Malignant Tumors arising in Congenital Males. Johns Hopkins Bulletin. XI.
3. 1903. Histogenesis of the Adrenal Gland. Amer. Jour. of Anatomy. II.
4. 1904. Embryonic Development of the Interstitial Cells of Leydig. Amer. Jour. of Anatomy. III.
5. Post-Embryonic Development of the Interstitial Cells of Leydig. Amer. Jour. Anat. IV.
6. 1905. Malignant Teratoma of the Perinaeum. Jour. Exp. Medicine. VI.

William deBerniere MacNider. M. D., University of North Carolina, 1902. Professor of Pharmacology, University of North Carolina, 1905— Member of American Medical Association, Medical Society of N. C. Co-Laborator of the American Journal of Pharmacology; Member of the Committee of the American Medical Association on Revision of the Course in Pharmacy. Member of the Committee on Revision of the U. S. Pharmacopoeia (appointed by the N. C. Medical Society). Member of American Association of Bacteriologists and Pathologists.

1. 1907. Fibroma Durum of the Left Ovary. A Pathological Report. N. Y. Medical Journal.
2. Some of the Later Manifestations of Syphilis, with Report of Cases. Charlotte Medical Journal. Sept., 1907.
3. 1908. Tubercular Salpingitis. Charlotte Medical Jour.
4. Action of Nitrites on the Heart. Amer. Jour. Medical Sci. Jan.
5. A Further Study of the Action of Magnesium Sulphate on the Heart. Amer. Jour. Phys. XX. No. 2.
6. Streptococcus Infections of the Tonsils, Their Diagnosis and Relationship to Acute Articular Rheumatism. Char. Med. Jour., Sept.
7. 1909. The Production of Morbid Changes in the Blood Vessels of the Rabbit by Alcohol. Archives of Internal Medicine. March.

8. Malignant Degeneration of Pigmented Moles. Virginia Semi-Monthly Medical Journal.
9. Alcohol. Char. Medical Journal. August.
10. The Teaching of Pharmacology in the Smaller Medical Schools. Southern Medical Journal. August.
11. The Spontaneous Occurrence of Cardio-Vascular Diseases in the Dog. Southern Medical Journal. September.
12. The Pathological Changes which develop in the Kidney as a Result of Occlusion by Ligature of one Branch of the Renal Artery. Jour. Med. Research. December.

DAVID HOUGH DOLLEY. B. A., Randolph-Macon, 1898; M. D. Johns Hopkins University, 1902. Resident Pathologist, Lake Side and Charity Hospitals, Cleveland, Ohio, 1902-04; Research Assistant to Dr. George Crile, 1904-06. Professor of Microscopic Anatomy and Pathology, University of North Carolina, 1906-1910. Member of American Association of Pathologists and Bacteriologists, Cleveland, Ohio Acadamy of Medicine.

1. 1906. An Experimental Research into the Resuscitation of Dogs Killed by Anaesthetics and Asphyxia (Dolley and Crile). Jour. Exp. Med. Vol. VIII.
2. 1908. On the Effect of the Complete Anaemia of the Central Nervous System in Dogs Resuscitated after Relative Death. Jour. Exp. Med. X.
3. The Pathological Cytology of Surgical Shock. I. Preliminary Communication. The Alterations Occurring in the Purkinje Cells of the Dog's Cerebellum. Jour. Med. Research. XX. No. 3.
4. 1909. The Morphological Changes in Nerve Cells Resulting from Over-Work in Relation with Experimental Anaemia and Shock. Jour. Med. Research. XXI. No. 1.
5. Neurocytological Reaction in Muscular Exer-

tion. I. Preliminary Communication. The Sequence of the Immediate Changes in the Purkinje Cells. Amer. Jour. Physiology. XXV. No. 2.

Richard Henry Lewis. M. D., University of Maryland, 1871. Resident Physician, Baltimore Infirmary (now University of Maryland Hospital) 1872-3; Member of the N. C. Board of Medical Examiners, 1880-84; President of the Medical Society of N. C., 1891; Professor of Diseases of the Eye and Ear, Savannah Medical School, 1875-6; Leonard Medical School (Raleigh), University Medical Department (Raleigh); Surgeon for the Eye and Ear, St. Johns Hospital, Rex Hospital, Leonard Medical School Hospital, St. Agnes Hospital (Raleigh); Secretary of the State Board of Health, 1892-09; President of the National Conference of State and Provincial Boards of Health of North America, 1906; President of the American Public Health Association, 1908; Member of the Board of Directors of the State Sanatorium for Tuberculosis; Represented the American Public Health Association at the Conference at the White House on the Conservation of National Resources, 1908; Professor of Diseases of the Eye and Ear, University of North Carolina Medical Department (Raleigh) 1902-10. Member of American Medical Association; Medical Society of North Carolina; Wake County Medical Society; Raleigh Academy of Medicine; American Public Health Association; Conference of State and Provincial Boards of Health of North America; National Association for the Study and Prevention of Tuberculosis; N. C. Association for the Prevention of Tuberculosis; Charter Member of the American School Hygiene Association; American Health League; N. C. Academy of Science.

1. How We See, with a Consideration of the Errors of Refraction Opthalmia Neonatorum.
2. The Care of the Eyes and Ears (for distribution among the Public Schools.)
3. Drinking Water in its Relation to Malarial Diseases.

4. The Prevention of Tuberculosis.
5. Instruction for Quarantine and Disinfection.
6. The Prevention of the Spread of Tuberculosis. (Presidential Address, Conference of State and Provincial Boards of Health of North America at Washington, D. C.).
7. The Organization of a National Department of Health. (Presidential Address, American Public Health Association, Winnepeg, Canada.)

HUBERT ASHLEY ROYSTER. B. A., Wake Forest College, 1891; M. D. University of Pennsylvania, 1894. Resident Surgeon, Mercy Hospital, Pittsburg, Pa., 1894-5; President Tri-State Medical Association of the Carolinas and Virginia, 1907; Surgeon-in-Chief, St. Agnes' Hospital, Raleigh; Gynecologist, Rex Hospital, Raleigh; Surgeon to the Southern Railway; Dean and Professor of Gynecology, University of North Carolina Medical Department in Raleigh, N. C. Member of American Medical Association; Medical Society of N. C.; Wake Co. Medical Society; Raleigh Academy of Medicine; Southern Surgical and Gynecological Association; Tri-State Medical Association of the Carolinas and Virginia.

1. Abdominal Operations During Pregnancy, with Report of five Cases.
2. Clinical Types of Dysmenarrhoea.
3. Scopolamine-Morphine-Ethyl Chloride-Ether-Anesthesia Surgery. Gynecology and Obstetrics. Feb. 1906.
4. Management of Dislocations at the Shoulder-joint Complicated by Fracture of the Neck of the Humerus. Jour. Amer. Med. Assoc. Aug. 10, 1907.
5. A Case of Combined Intra and Extra-Uterine Pregnancy at Term. Amer. Jour. Obsteterics. XXXVI, No. 6.
6. Locating Fistulae in the Lower Intestinal Tract by Injecting Hydrogen Dioxide through the Anus.

7. Appendicitis in the Negro. Mobile Medical and Surgical Jour. Jan. 1907.
8. A Case of Ovarian Febroma. N. Y. Medical Jour. Jan. 3, 1903.
9. On Sterilization of Cutting Instruments. Annals of Gynecology and Pediatrics. Feb. 1905.
10. Inconsistencies of the Gauze Pack. Annals of Surgery. Aug. 1908.
11. Types of Modern Doctors. Presidential Address, Tri-State Medical Association of the Carolinas and Virginia, 1907.
12. What is Minor Surgery? Old Dominion Journal of Medicine and Surgery. March 1909.

PHARMACY

Edward Vernon Howell. A. B. Wake Forest College, 1892. Ph. G., Philadelphia College of Pharmacy, 1894. Professor of Pharmacy, University of North Carolina, 1897— Member N. C. Pharmaceutical Society; American Pharmaceutical Association; American Chemical Society.

1. 1900. Alcohol, Its Use as an Antidote to Carbolic Acid. Proc. Amer. Phar. Assoc.
2. Fluid Extracts (with D. E. Swindell.) Proc. N. C. Phar. Assoc. and Bulletin of Pharmacy.
3. Pharmacy among the Ancients (with C. D. Gruver). Proc. N. C. Phar. Assoc. and National Druggist.
4. 1902. Syrup of Ferrous Iodide. Proc. N. C. Phar. Assoc.
5. Formulas for and Cost of making Tablets (with P. C. Gray). Proc. N. C. Phar. Assoc.
6. Amyl Alcohol, a Test to Distinguish Solanin from Solanidin. Bulletin of Pharmacy.
7. Medical Superstitions in North Carolina. Bull. of Pharmacy.
8. 1906. Coloring Matter of Certain Grape Skins as an Indicator. Proc. Amer. Phar. Assoc.

9. Review of "The English Physitian" of Nich. Culpeper (1653). Proc. Amer. Phar. Assoc.
10. Comments on a Prescription File. (1862-1864) Proc. Amer. Phar. Assoc.
11. 1907. Pharmaceutical Data before and during the Civil War. Proc. Amer. Phar. Assoc.
12. Practical Tests for Drugs included in the Pure Food and Drug Law (with R. H. Kibler.) Proc. N. C. Phar. Assoc.
13. 1910. On the Future of Pharmacy. Pharmaceutical Era.

PHYSICS

JOSHUA WALKER GORE. C. E., Richmond College. C. E., University of Virginia. Fellow, Johns Hopkins University. Professor of Physics, Southewestern Baptist University; Assistant, University of Virginia; Professor of Physics, University of North Carolina, 1883-1908. Died, March 1908.

1. 1882. Key to Newcomb's College Algebra. In collaboration with J. Howard Gore.
2. 1899. Electrical Transmission of Power. Bulletin N. C. Geological Survey.
3. 1900. Telephone System. Patent No. 644594.
4. 1902. Wireless Telegraphy, An Electrostatic Effect? Electrical World & Engineer. XL. No. 2.
5. Wireless Telegraphy. Patent No. 781823. (with W. C. A. Hammel).

JAMES EDWARD LATTA. Ph.B., University of North Carolina, 1899; A. M., University of North Carolina, 1901; Student, Harvard University, Cornell University, Brooklyn Polytechnic Institute. Instructor in Physics, Associate Professor of Physics and Professor of Electrical Engineering, University of North Carolina, 1900-1910.

1. 1908. Series Lamp Leads on Constant Potential Circuits. Power.
2. 1909. Why Use a Rheostat in an Alternator Field Circuit? Power & Engineer. XXXI. No. 23.

3. The Care of Commutators and Brushes. Power and Engineer. XXXI. No. 26.

Andrew Henry Patterson. Ph. B., B. A., the University of North Carolina, 1891; B. A., Harvard University, 1892; M. A., 1893; Student University of Berlin, Charlottenburg Technische Hochschule, the University of Cambridge; Instructor in Physics, Adjunct Professor of Physics and Electrical Engineering, Professor of Physics and Astronomy, the University of Georgia, 1894-1908 Professor of Physics, the University of North Carolina, 1908— Fellow American Association for the Advancement of Science; Member the American Physical Society; the American Electrochemical Society; Association of Harvard Engineers; Soc. Promotion of Engineering Education.

1. 1909. The "Pinch Effect" in Unidirectional Electric Sparks. Science. January 1, 1909.
2. Meteor Observation. (Note, with Map). Popular Astronomy. No. 162. February.
3. The Probable Electrical Nature of Chemical Energy. Trans. Amer. Electrochemical Soc. XV.
4. Origin of the Moon. Science. June 11, 1909.
5. 1910. The Evolution of Worlds. Book Review North Carolina Review. May 1, 1910.
6. The Reform of the Calendar. Science. October 14, 1910.

ZOOLOGY

Geo. F. Atkinson. See under Botany.

1. 1886. The Cigarette Beetle. Mitch. Sci. Soc. J. III. 68.
2. Notes on the Orchard Scolytus. Mitch. Sci. Soc. J. III. 74.
3. 1887. A New Trap-Door Spider. Mitch. Sci. Soc. J. IV. 16.
4. A Family of Young Trap-Door Spiders. Mitch. Sci. Soc. J. IV. 25.
5. Description of some New Trap-Door Spiders and

their Nests and Food Habits. Mitch. Sci. Soc. J. IV. 33.

6. Preliminary Catalogue of the Birds of North Carolina with Notes on some of the Species. Mitch. Sci. Soc. J. IV. 44.
7. Singular Adaptation in Nest-making by an Ant, Crematogaster Lineolata, Say. Mitch. Sci. Soc. J. IV. 88.
8. A Remarkable Case of Phosphorescence in an Earth-Worm. Mitch. Sci. Soc. J. IV. 89.
9. Observations on the Female Form of Phengodes Laticollis. Hom. Mitch. Sci. Soc. J. IV. 92.
10. 1888. New Instances of Practical Resemblance in Spiders. Mitch. Sci. Soc. J. V. 28.
11. Note on the Tube-inhabiting Spider, Lycosa fatifera. Hentz. Mitch. Sci. Soc. J. V. 30.
12. Soaring of the Turkey Vulture. Mitch. Sci. Soc. J. V. 59.

HENRY VAN PETERS WILSON. B. A. Johns Hopkins University, 1883; Ph. D., 1888. Assistant U. S. Fish Commission, 1889-1891. Professor of Biology in the University of North Carolina, 1891-1904; Professor of Zoology, 1904— Fellow American Association for the Advancement of Science; Member the American Society of Zoologists (Vice-President, 1908); Washington Biological Society; Boston Society of Natural History.

1. 1891. The Embryology of the Sea-Bass. Bull. U. S. Fish Com. IX. 209.
2. Notes on the Development of Some Sponges. J. Morph. V. 511.
3. 1892. Remarks on the General Morphology of Sponges. Mitch. Sci. Soc. J. IX. 31.
4. 1893. Primitive Streak and Plastopore of the Bird Embryo. Mitch. Sci. Soc. J. X. 69.
5. 1894. Observations on the Gemmule and Egg Development of Marine Sponges. J. Morph. IX. 277.

6. Review of "Embryogenia des Eponges" par Ives Delage. Am. Nat. XXVIII. 73.
7. Review of "Die Embryonal Entwicklung und Metamorphoso der Cornacuspongien" von Otto Maas. Am. Nat. 1894. 439.
8. 1895. A Description of some of the Muscles of the Cat (with G. H. Kirby). Mitch. Sci. Soc. J. 10.
9. 1897. Notes on the Natural History of the Wilmington District. Science. VI. 1.
10. On the Origin of the Vertebrate Sense Organs. Mitch. Sci. Soc. J. XIV. 56.
11. The Lateral Sensory Anlage in the Salmon (with J. E. Mattocks). Anatom. Anzeiger XIII. 658.
12. 1898. The Cubomedusae (Review). Science VIII. 481.
13. On the Feasibility of Raising Sponges from the Egg. Bull. U. S. Fish Com. 241.
14. 1899. Adriatic Sponges (Review). Am. Nat. XXXIII. 334.
15. Biology at the University of North Carolina. Gulf Fauna and Flora Bull. 1899. 23.
16. 1900. Marine Biology at Beaufort. Am. Nat. XXXIV. 339.
17. Notes on a Species of Pelomyxa. Am. Nat. XXXIV. 403.
18. The Laboratory of the U. S. Commission at Beaufort. Sci. X. 647.
19. Formation of the Blastopore in the Frog Egg. Anat. Anzeiger. XVIII. 209.
20. 1901. Closure of the Blastopore in the Noramlly Placed Frog Egg. Anat. Anzeiger. XX. 123.
21. The Work of the Beaufort Laboratory of the U. S. Fish Commission. Science. 739.
22. 1902. On the Asexual Origin of the Ciliated Sponge Larva. Am. Nat. XXXVI. 451.
23. The Sponges collected in Porto Rico in 1899 by

the U. S. Fish Commission Str. "Fish Hawk". Bull. U. S. Fish Com. 375.

24. 1904. Reports of an Exploration off the West Coasts of Mexico, Central and South America and of the Galapagos Islands, in charge of Alexander Agassiz, etc. The Sponges. Memoirs Museum Comp. Zool. at Harvard Coll. XXX No. 1, pp. 164 with 26 plates.

25. 1906. The Coral Siderastrea radiaus and its Post Larval Development (Review). Science. 497.

26. 1907. A New Method by which Sponges may be Reared. Science. 912.

27. On some Phenomena of Coalescence and Regeneration in Sponges. J. Exp. Zool. V. 245.

28. 1908. On the Development of Sponges from Tissue Cells outside the Body of the Parent. Proc. Internat. Fish Cong.

29. 1909. On the Structure and Regeneration of the Epidermal Layer in some Siliceous Sponges. Proc. Am. Soc. Zool.

JAMES E. DUERDEN. Acting Professor of Biology in the University of North Carolina, 1902-03.

1. 1902. Aggregated Corals in Madreporaria Colonies. Am. Nat. XXXVI.

2. The Morphology of the Madreporaria. II. Increase of Mesenteries in Madrepora beyond the Protocnemic Stage. Annals. Nat. Hist. X.

3. Boring Algae as Agents in the Disintegration of Corals. Bull. Am. Mus. Nat. Hist. XVI. 323.

4. The Morphology of the Madreporaria. III. The Significance of Budding and Fusion. Annals Nat. Hist. X. 382.

5. West India Madreporarian Polyps. Mem. Nat. Acad. Sci. VIII. 401.

6. 1903. A Method of Studying the Septal Sequence in Palaeozoic Corals. Mitch. Sci. Soc. J. XVIII. 32.

The record of work given above would be incomplete without reference to the Marine Biological Laboratory of the U. S. Bureau of Fisheries located at Beaufort, N. C. The U. S. Geological Survey and the biological departments of the University were closely concerned in the establishment of this admirable institution for research, and a brief sketch of its foundation seems appropriate in this place.

In June, 1897, after consultation with Prof. J. A. Holmes, State Geologist of N. C. and Lecturer in Geology in this University (formerly Professor of Geology and Natural History), and Prof. H. V. Wilson, the U. S. Commissioner of Fisheries, Hon. Geo. M. Bowers, established a temporary station for the investigation of the marine fauna and flora of the southern coast at Beaufort, N. C. (See Report of the Commissioner for 1899.) Prof. Wilson was placed in charge of the station and among the investigators of the first season was Prof. Coker. For the next three years Prof. Wilson continued to serve as director of the laboratory, and both he and Prof. Holmes devoted much time and thought to its development. Congress was eventually prevailed upon to pass a bill appropriating money for the establishment of a permanent laboratory. Prof. Holmes recommended a site, and arranged for its private purchase and its donation to the Government. He together with Prof. Wilson drew up the outline plans for the laboratory buildings, and they both remained in close consultation with the Bureau of Fisheries until the completion of the new laboratory. The enterprise having then been successfully launched, Prof. Wilson resigned his post as director. The Beaufort Laboratory is one of the best situated and equipped of the marine laboratories of the world. Members and ex-members of the biological departments of the University continue to make use of it for the purpose of research year after year, and its existence has exerted a very beneficial influence on the development of biology in this and other universities and colleges, particularly in the South.

THE ELISHA MITCHELL SCIENTIFIC SOCIETY

This Society has been so important a factor in encouraging and developing the spirit of scientific investigation at the University of North Carolina that a brief account of its work is a necessary supplement to this record. It was founded when the new University was struggling upwards in the midst of many difficulties and discouragements. Equipment was scanty, the faculty small and overworked and the sense of isolation depressing. The union of effort and the monthly meetings, with evidence of earnest work going on, brought inspiration and courage. Its influence on faculty and students has been shown with increasing force throughout the years of its existence.

On September 24th, 1883, five young men connected with the University gathered to consider the formation of a scientific society. These were J. W. Gore, R. H. Graves, J. A. Holmes, W. B. Phillips, and F. P. Venable. The first two died in the service of the University and the last serves it still as its president. Dr. Holmes is Director of the U. S. Bureau of Mines, and Dr. Phillips is in charge of the Economic Geological Survey for the State of Texas. A call was drawn up by these gentlemen and sent to all who were thought to be interested in the progress of science and the development of the State. The proposed aims of the society were the arousing of an increased interest in scientific work, the building up of a spirit of research; the encouraging of those already at work and the advancing of the knowledge of the State and its resources. The society was named in honor of Elisha Mitchell, Professor in the University from 1819 to 1857.

At a second meeting on October 1st, 1883, a regular constitution was adopted, and the first monthly meeting was held on the second Saturday in November. The following were the first officers: President, F. P. Venable, Vice-President, J. A. Holmes, Secretary and Treasurer, J. W. Gore. The members the first year numbered one hundred and fifty-six. Seven meetings were held during the first year, and the attendance filled the hall to overflowing.

The publication of an annual journal was a part of the Society's program and the first volume appeared in 1884. It contained 98 pages. Sixty-seven papers were presented at the seven meetings of the first year. The treasurer's report for the first year showed the receipt of $164.50. As the outside members speedily lost interest and receipts from this source fell off to an embrassing extent, the Trustees of the University after a year or so made an annual appropriation of $100.00 for the publication of the Journal. In the whole history of the Society the amount available for publication and other expenses has seldom exceeded $200.00. The membership in a short time became practically limited to members of the teaching staff and student body of the University and remains so at the present time.

With the fourth volume, issued in 1887, the Journal was changed from an annual to a semi-annual publication, and again in 1900, with volume XX, the Journal became a quarterly and is issued in this form at present.

Twenty-eight volumes in all have appeared, comprising more than 3000 pages. More than two hundred meetings have been held and many papers read. These facts alone cannot have failed to make a deep impression upon the intellectual life of the institution.

The Journal has on its exchange list more than three hundred societies, academies and other scientific journals. Through this exchange list and gifts the Society has accumulated a valuable library of several thousand volumes.

THE NORTH CAROLINA GEOLOGICAL SURVEY

For the reason that the State Survey since its establishment in 1823 has been very intimately connected with the University, though not an organic part of it, it is proper that some account of its history and work should be given here.

With the exception of Dr. Emmons, the State Geologists have been members of the teaching force of the University, and almost continuously the offices have been located at the University and are so at present.

OUTLINE OF GEOLOGICAL SURVEY WORK IN NORTH CAROLINA

It is worthy of note that the first Geological Survey by public authority in America was established by North Carolina. In 1823 an act of the General Assembly authorized the Board of Agriculture to pay the expenses of "geological excursions" for a period of years. This first work was begun by Professor Dennison Olmsted of the State University, and resulted in the publication of the following reports:

1. Descriptive catalogue of rocks and minerals collected in North Carolina.
2. Letter to the Board of Internal Improvements on the geology of North Carolina.
3. On the gold mines of North Carolina.
4. Red sandstone formation of North Carolina.
5. Report on the geology of North Carolina, conducted under the Board of Agriculture.
6. Thermometrical observations made by President Caldwell, at Chapel Hill, North Carolina, during the years 1820, 1821, 1822.
7. Useful minerals in North Carolina.
8. On the French Broad River, North Carolina.
9. The Ore Knob Copper Company.

On his removal to Yale in 1825, the Survey was continued by Dr. Elisha Mitchell, also of the State University. Dr. Mitchell published the following reports in connection with his administration:

1. Altitude and soils of Western North Carolina.
2. Diary of a geological tour by Dr. E. Mithell in 1827-1828
3. Elements of geology, with an outline of the geology of North Carolina.
4. Geological report of Professor Mitchell.

5. Notice of the height of mountains in North Carolina.
6. On the characters and origin of the low country of North Carolina.
7. On the geology of the gold region of North Carolina.
8. Report on the geology of North Carolina, conducted under the Board of Agriculture.
9. Gold veins in the syenetic of the Salisbury and Greensborough belt, North Carolina.

In 1852 Dr. Ebenezer Emmons was appointed State Geologist, and during his regime a number of reports were published relating to the geology and natural history of the State, as follows:

1. Agriculture, containing descriptions, with many analyses of the soils of the swamp lands.
2. Agriculture of North Carolina, pt. 2, containing a statement of the principles of the science upon which the practices of agriculture as an art are founded.
3. American geology, containing a statement of the principles of the science, with full illustrations of the characteristic American fossils.
4. Appendix to the special report made to Gov. Bragg relative to the resources of the valley of Deep River and its advantages as a site for a national foundry.
5. The chemical constitution of certain of the Chatham series in the valley of Deep River, North Carolina.
6. Coal in North Carolina.
7. Geological and agricultural survey.
8. Geological report of the midland counties of North Carolina.
9. Gold veins in the syenetic of the Salisbury and Greensborough belt, North Carolina.
10. Manual of Geology. Designed for the use of colleges and academies.
11. National foundry.—Deep River, N. C. Special report concerning the advantages of the valley of the Deep river as a site for the establishment of a national foundry.

12. A national foundry in North Carolina.
13. North Carolina iron.
14. On age of trias in Virginia and North Carolina.
15. On new fossil corals from North Carolina.
16. Permian and triassic systems from North Carolina.
17. Report of Prof. Emmons on his geological survey of North Carolina.
18. Report of the North Carolina geological survey. Agriculture of the eastern counties, together with descriptions of the fossils of marl beds.
19. Report of the progress and present state of the geological and agricultural survey of North Carolina.
20. Report on the natural resources of that part of North Carolina west of the Blue Ridge.
21. Report on the Rhea mining property, Mecklenburg County, North Carolina.

On the death of Dr. Emmons in 1866, Dr. W. C. Kerr was appointed State geologist. He carried on the work until his death in 1885. During Dr. Kerr's administration the following reports and scientific notices were published.

1. Appendix to the report of the Geological Survey of North Carolina, 1873, being a brief abstract of that report, and a general description of the state, geological, geographical, climatic and agricultural.
2. The developed and undeveloped mineral wealth in North Carolina. Distribution and character of the oecene deposits in eastern North Carolina.
3. Geological relations of the topography of the south Appalachian plateau.
4. Geological survey of North Carolina.
5. The geology of Hatteras and the neighboring coast.
6. The gold gravels of North Carolina—their structure and origin.
7. Letters to the North Carolina Land Co., enumerating general resources of the state.
8. Marls of North Carolina.

9. The mica veins of North Carolina.
10. Mineral resources of North Carolina.
11. Minerals and mineral localities of North Carolina, being Capter I of the second volume of the Geology of North Carolina.
12. The minor minerals of North Carolina.
13. North Carolina, containing general description of the state and its resources, including geology, minerals, soils, forests and mining.
14. North Carolina building stones.
15. North Carolina resources, being a Letter to the Governor describing resources of the state, and the geological investigations in progress.
16. Note on uranium minerals in North Carolina.
17. Observations on the mesozoic of North Carolina.
18. On frost drift in North Carolina.
19. On peculiarities of the mode of occurrence of gold in North Carolina.
20. On some points in the stratigraphy and surface geology of North Carolina.
21. On the action of frost in the arrangement of superficial earthy material.

On the death of Professor Kerr, the Geological Survey was allowed to lapse until 1891, when it was placed on a different footing upon the establishment of the North Carolina Geological Survey and the appointment of Professor Joseph A. Holmes of the State University as State Geologist.

The object of this Survey as expressed in the Act of the General Assembly authorizing it was "The thorough examination of the nature and extent of the mineral and timber resources of the State." In the first biennial report of Professor Holmes he states:

"After a careful consideration of the work accomplished by preceding Geological Surveys in the State—under Emmons and Kerr—the results from both of these having been lost in large measure by not having been published, it was found that

a considerable amount of general exploration would be necessary in many portions of the State before undertaking, or in connection with, the examination of special mineral deposits."

The work of this Survey resulted in the publication of a series of reports as follows:

BULLETINS

1. Iron Ores of North Carolina, by Henry B. C. Nitze, 1893.
2. Gold Deposits in North Carolina, by Henry B. C. Nitze and George B. Hanna, 1896.
3. Road Material and Road Construction in North Carolina, by J. A. Holmes and William Cain, 1893.
4. The Forests, Forest Lands and Forest Products of Eastern North Carolina, by W. W. Ashe, 1894.
5. The Timber Trees of North Carolina, by Gifford Pinchot and W. W. Ashe, 1897.
6. Forest Fires: Their Destructive Work, Causes and Prevention, by W. W. Ashe, 1895.
7. Water-powers in North Carolina, by George F. Swain, Joseph A. Holmes, and E. W. Myers, 1899.
8. Monazite and Monazite Deposits in North Carolina, by Henry B. C. Nitze, 1895.
9. Gold Mining in North Carolina and other Appalachian States, by Henry B. C. Nitze and A. J. Wilkins, 1897.
10. Corundum and the Basic Magnesian Rocks of Western North Carolina, by J. Volney Lewis, 1895.
11. Clay Deposits and Clay Industries in North Carolina, by Henrich Ries, 1897.
12. The Tin Deposits of the Carolinas, by Joseph Hyde Pratt and Douglass B. Sterrett, 1905.

ECONOMIC PAPERS

13. The Maple-Sugar Industry in Western North Carolina, by W. W. Ashe, 1897.
14. Recent Road Legislation in North Carolina, by J. A. Holmes.

15. Talc and Pyrophyllite Deposits in North Carolina, by J. H. Pratt, 1900.
16. The Mining Industry in North Carolina during 1900, by J. H. Pratt, 1901.
17. Road Laws of North Carolina, by J. A. Holmes.
18. The Mining Industry in North Carolina during 1901, by J. H. Pratt, 1902.
19. Mining Industry in North Carolina during 1902, by Joseph H. Pratt, 1903.
20. The Mining Industry in North Carolina during 1903, by J. H. Pratt, 1904.

BIENNIAL REPORTS

1. 1891-1892.
2. 1893-1894.
3. 1895-1896.
4. 1897-1898.
5. 1899-1900.
6. 1901-1902.
7. 1903-1904.

GOOD ROAD CIRCULARS

1 to 37, inclusive.

This Geological Survey continued its work until 1905, when the Act creating it was repealed and a new Act passed by the Legislature of 1905, establishing the present Survey, known as the North Carolina Geological and Economic Survey. During this year of 1905 and until October, 1906, Joseph Hyde Pratt, State Mineralogist ,was acting State Geologist in the absence of Professor Holmes, who was in St. Louis, as Chief of the Department of Mines and Metallurgy of the Louisiana Purchase Exposition. On October 29, 1906, Dr. Joseph Hyde Pratt was formally appointed State Geologist.

The North Carolina Geological and Economic Survey, established by the General Assembly of North Carolina in February, 1905.

The Act establishing the North Carolina Geological and

Economic Survey provides that the State Geologist shall be appointed by the Governor to conduct the work of the Survey under the supervision of a Board of Managers, known as the Geological Board, this Board to consist of four citizens of the State and the Governor as Chairman. The members of the Geological Board are to be appointed by the Governor with the consent of the Senate, two for a period of two years and two for a period of four years, beginning March 1, 1905. The objects of the Geological Survey as contained in this Act are as follows:

"(1) An examination of the mineral, forest, fishery and other material resources of the State.

(2) An examination of the geological formations of the State with reference to their economic products.

(3) An examination of the road-building materials and the best methods of utilizing the same.

(4) An examination and classification of the soils and forests and other physical features of the State with special reference to their bearing upon the occupation of the people.

(5) An examination of the streams and waterpowers of the State with special reference to the development for manufacturing enterprises and the preservation of the sources of these streams through the protection of the forests.

(6) The consideration of such other scientific and economic problems as in the judgment of the Geological Board shall be deemed of value to the people of the State.

(7) The preparation of such reports, illustrations and maps as may be deemed necessary in placing the results of these investigations before the public.

(8) And the State Geologist, with the approval of the Geological Board, is hereby authorized to arrange for and accept such aid and co-operation from the several United States Government Bureaus and other sources as may assist in completing the topographic surveys of the State and in carrying out other provisions of this Act.

(9) An examination of the water supplies of the State with special reference to the sinking of deep or artesian wells."